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AUTHOR INDEX

A

- Aaron, T. E. and Dr. Ronald Wolosewicz—"Electrochemical Machining," Dec. 11, p. 160
Allen, C. W.—"Pulse Operation of Solenoids," May 1, p. 170
Aronson, Robert
 "Riot Control," Jan. 9, p. 22
 "What Good is Holography?," Jan. 23, p. 26
 "Where Roads Don't Count," May 1, p. 36
 "River-Boat Design," July 10, p. 20
 "European Fighter Aircraft," Oct. 16, p. 44
Aronson, Robert and Nat F. Wood—"Nerva—Key to Deep Space Flight," July 24, p. 24

B

- Bannister, R. L. and D. V. Wright—"Prognosis with Plastic Models"
 Part 1: "Vibration and Deflection Study," Aug. 21, p. 134
 Part 2: "Scaling and Fabrication," Sept. 4, p. 136
 Part 3: "Instrumentation for Dynamic Testing," Oct. 2, p. 128
 Part 4: "Material Properties and Sample Study," Oct. 16, p. 178
Barnes, Sam
 "Boom in Bottom Bases," Feb. 6, p. 18
 "Grafting Men Together Again," Aug. 21, p. 21
Barry, John K.—"Quick-Operating Fasteners," *Fastening & Joining Reference Issue*, Sept. 11, p. 101
Bassett, G. L. and Frank Burt—"Manual Switches," *Electric Controls Reference Issue*, Mar. 13, p. 4
Baumgartner, Thomas C.—"How Fasteners Are Made," Jan. 9, p. 136
Bayer, R. G. and A. R. Wayson—"Designing for Measurable Wear," Aug. 7, p. 118
Bayer, R. G., A. T. Shalkey, and A. R. Wayson—"Zero Wear," Jan. 9, p. 142
Becker, William E.—"Designing with Felt," June 26, p. 113
Beiling, Thomas E.—"Electromechanical or Solid State?," July 24, p. 122
Benes, James J.
 "Automatic Assembly," Mar. 20, p. 193
 "Automatic Assembly," *Fastening & Joining Reference Issue*, Sept. 11, p. 129

- Benes, James J. and Lawrence C. Lynnworth—"Measuring Temperature," Nov. 13, p. 190
Bickford, John H.—"Technical Codes: The Language of Machines," Sept. 4, p. 108
Black, Frederick W.—"An Aerospace Industry Report on TPD," Mar. 20, p. 177
Blandino, Edward P.—"Designing Torsion Springs," Mar. 6, p. 134
Bonneau, F. X.—"Counters," *Electric Controls Reference Issue*, Mar. 13, p. 59
Booser, E. R. and Richard C. Elwell—"Flat-Pad Thrust Bearings," Sept. 4, p. 141
Borcina, David M. and Jerome F. Smith—"Soldering and Soldering Alloys," *Fastening & Joining Reference Issue*, Sept. 11, p. 116
Boyce, H. L.—"Lip Types," *Seals Reference Issue*, June 19, p. 40
Boyd, Ellsworth—"Underwater Watchdogs," May 29, p. 31
Braendel, Felix W.—"Pin Fasteners," *Fastening & Joining Reference Issue*, Sept. 11, p. 70
Brenner, Harry S.—"Fastener Evaluation," *Fastening & Joining Reference Issue*, Sept. 11, p. 24
Breur, George—"Analytically Magnified Gear Tooth Profiles," Feb. 20, p. 167
Brown, Harry K.—"SPARK For Keeping a Project on Schedule," May 15, p. 138
Brown, Paul L.—"The Failure of Functionalism," Dec. 11, p. 144
Burgess, John A.—"Organizing Design Problems," Nov. 27, p. 120
Burnett, J. R.—"Friction and Traction Drives," *Mechanical Drives Reference Issue*, Dec. 18, p. 30
Burt, Frank and G. L. Bassett—"Manual Switches," *Electric Controls Reference Issue*, Mar. 13, p. 4

C

- Carlock, Jack and Paul S. Strauss—"Common Sense Needs an Assist," July 24, p. 102
Carr, Houston H.—"Paper Work For Job Hunting," Aug. 7, p. 102
Cavasin, John, Jr.—"Designing Printed Wiring Boards," Jan. 23, p. 133
Chipman, Lester D.—"How the New Grads Measure Up," Sept. 18, p. 227
Chung, Jackson—"Shaft-Mounted Reducers," *Mechanical Drives Reference Issue*, Dec. 18, p. 41
Clarke, Emerson—"Government Information Sources," Oct. 30, p. 98

Collins, Gary W.—"Electric Motors," Jan. 9, p. 152
 Cook, D. V. and R. A. Hultin—"Build Your Own Analog Simulator," Aug. 7, p. 128
 Correns, H.—"Product Planning by Computer," Jan. 23, p. 181
 Corrigan, Michael and Lee Eichenseer—"Picking The Right Connector," Feb. 20, p. 162
 Cozzaria, Edward—"Mechanical Clutches," *Mechanical Drives Reference Issue*, Dec. 18, p. 43
 Crawshaw, S. L. and H. O. Kron—"Gears," *Mechanical Drives Reference Issue*, Dec. 18, p. 19
 Crews, Warren—"Digital Integrated Circuits," *Electric Controls Reference Issue*, Mar. 13, p. 71
 Curran, William—"Subminiature Lamps," Nov. 27, p. 134

D

Dombeck, Edward K.—"Mechanical Brakes," *Mechanical Drives Reference Issue*, Dec. 18, p. 54
 Dankowski, T. P. and A. G. Lippert—"Computer Graphics" Part 1: "The Engineer and the CRT Terminal," Apr. 17, p. 227
 Part 2: "The Problems You Can Solve," May 1, p. 148
 D'Aprix, Roger M.—"Building 'Show' Biz Into Technical Talks," Apr. 3, p. 127
 "Bridging the Communications Gap . . . from Your Side," Nov. 13, p. 180
 DeGeorge, William F.—"Ingredients for Successful Proposals," Apr. 3, p. 122
 Dibbern, Donald A. and V. E. James—"Stepping Switches," *Electric Controls Reference Issue*, Mar. 13, p. 47
 Doane, Russell C.—"Packaged Discrete Modules," *Electric Controls Reference Issue*, Mar. 13, p. 77
 Dreger, Donald R.—"Plastic Molding—or Metal Die Castings?," July 24, p. 113
 Dreisliker, Henry—"The Polyphase Variable-Speed Commutator Motor," July 10, p. 130
 Duncan, Robert I.—"Eliminating Vanishing-Point Spread," Aug. 21, p. 139
 Dunkle, Heber H.—"General Types," *Seals Reference Issue*, June 19, p. 76

E

Ebel, Fred E.—"Read It Like It Is," Mar. 20, p. 175
 Eichenseer, Lee and Michael Corrigan—"Picking The Right Connector," Feb. 20, p. 162
 Esposito, A.—"Analyzing Hydraulic Circuits," Oct. 16, p. 173
 Elwell, Richard C. and E. R. Booser—"Flat-Pad Thrust Bearings," Sept. 4, p. 141
 Eshel, A. and L. Licht—"Foil Bearings," May 15, p. 134
 Everrett, Malcolm H. and Howard G. Gillette—"Squeeze Types," *Seals Reference Issue*, June 19, p. 47
 "Elastomeric O-Rings," *Seals Reference Issue*, June 19, p. 73

F

Fairbanks, Donald R., Malcolm H. Knapp, and Allan K. Lazarus—"Synthetic Lubricants," July 10, p. 140
 Farrow, John—"Limit Switches," *Electric Controls Reference Issue*, Mar. 13, p. 17
 Foster, Vance J. and Ralph E. Probert—"Armature Relays," *Electric Controls Reference Issue*, Mar. 13, p. 44

G

Gaster, Glenn R.—"Magnetic Couplings," Apr. 3, p. 147
 Gastineau, R. L. and J. E. Kalasky—"O-Ring Types," *Seals Reference Issue*, June 19, p. 82
 Gigliotti, O. V. and H. A. White—"Magnetization of Permanent Magnets," July 24, p. 128
 Gillette, Howard G. and Malcolm H. Everrett—"Squeeze Types," *Seals Reference Issue*, June 19, p. 47
 "Elastomeric O-Rings," *Seals Reference Issue*, June 19, p. 73
 Goldberg, B. W.—"A New Engineering Facility," Mar. 6, p. 125
 Goldberg, Leonard Z.—"V-Band Couplings," Apr. 3, p. 138
 Grundtner, Robert R.—"Couplings," *Mechanical Drives Reference Issue*, Dec. 18, p. 60

H

Hart, John—"Hard Chromium," May 15, p. 144
 Haassoun, I. A.—"Stress in Noncircular Shafts," July 24, p. 132
 Hay, A. Donald—"Cooling Enclosed Electronics," Mar. 6, p. 140
 Herzog, Raymond E.—"Promote Your Idea," Mar. 6, p. 122
 Heumann, Gerhart W.—"Holography: What the Germans Are Doing," Sept. 18, p. 20
 "The Zeppelins Are Coming (Again?)," Oct. 2, p. 45
 Hibberd, Robert G.—"Basic Course in Integrated Circuits" Lesson 7: "Characteristics of Digital ICs," Jan. 9, p. 157
 Lesson 8: "Families of Digital ICs," Jan. 23, p. 163
 Lesson 9: "Elements of Linear ICs," Feb. 6, p. 153
 Lesson 10: "Basic Types of Linear ICs," Feb. 20, p. 160
 Lesson 11: "Standard Digital ICs," Mar. 6, p. 149
 Lesson 12: "Standard MOS and Linear ICs," Mar. 20, p. 215
 Lesson 13: "Integrated Electronic Components," Apr. 3, p. 155
 Lesson 14: "IC Applications, Present and Future," Apr. 17, p. 263
 Lesson 15: "ICs in Industrial Control," May 1, p. 187
 Hofmeister, William F.—"Roller Chain Ratings," May 29, p. 125
 Hopkins, R. Bruce—"Adapting Fatigue Data to Real Parts," June 12, p. 179
 Hormuth, Gustave A.—"Resistance Thermometers," July 10, p. 136
 "Thermocouple Pyrometry," Aug. 21, p. 129
 Howard, Nelson G.—"Temperature Switches," *Electric Controls Reference Issue*, Mar. 13, p. 31
 Hultin, R. A. and D. V. Cook—"Build Your Own Analog Simulator," Aug. 7, p. 128
 Hurst, T. P. and D. P. Wagner—"Washers," *Fastening & Joining Reference Issue*, Sept. 11, p. 63

I
 Isenbarger, Robert O.—"Exclusion Devices," *Seals Reference Issue*, June 19, p. 10

J

Jacobs, George R., Jr.—"Documenting Printed-Wiring Packages," May 15, p. 166
 Jackson, Daniel B.—"Rotary Shaft Seals," June 12, p. 171
 Jaibert, B. W.—"Switching Transistors," *Electric Controls Reference Issue*, Mar. 13, p. 64
 James, V. E. and Donald A. Dibbern—"Stepping Switches," *Electric Controls Reference Issue*, Mar. 13, p. 47
 Jones, Roger F.—"New Developments in Fortified Thermoplastics," Nov. 13, p. 205

K

Kahle, Herman—"Plan Promotes Productivity," Oct. 2, p. 102
 Kalasky, J. E. and R. L. Gastineau—"O-Ring Types," *Seals Reference Issue*, June 19, p. 82
 Karger, D. W. and R. G. Murdick—"Need-To-Know for the Manager-In-Training," July 24, p. 98
 Kauffman, Jack—"Hydraulic System Design" Part 1: "A Checklist Approach," Sept. 4, p. 118
 Part 2: "A Checklist Approach (cont.)," Oct. 2, p. 134
 Part 3: "Ensuring Thermal Stability," Oct. 30, p. 118
 Part 4: "Machine-Tool Traverse and Feed Circuits," Nov. 27, p. 144
 Part 5: "Control of Machine-Tool Feed," Dec. 25, p. 78
 Kear, Fred W.—"Sensing Suddenness," Aug. 7, p. 132
 Kirk, Roger—"Designing Tires For War," June 12, p. 46
 Kirkpatrick, Donald L. and William C. Young—"Dry-Lubricant Films," May 15, p. 163
 Khol, Ronald—"High Pressure Forming," Jan. 9, p. 124
 "A-C Fluidics," Feb. 6, p. 126
 "Computer Matches Designer, Methods Man As Working Team," Mar. 6, p. 127
 "Forged Powder Metal," Apr. 3, p. 142
 "Adaptive Control," May 1, p. 156
 "The Electric Brain," May 29, p. 102
 "Parts From Aluminum Powder," July 10, p. 110
 "Optical Computers," Aug. 21, p. 117
 "Noble Motives and Rich Rewards," Sept. 18, p. 178
 "Optoelectronics—Part 1," Oct. 16, p. 156
 "Optoelectronics—Part 2," Nov. 13, p. 208
 Klein, Stanley—"Just The Fax," Feb. 20, p. 20
 "Mechanizing the Mails," Mar. 20, p. 21
 "Technology for Learning" Part 1: "Machines That Teach," May 29, p. 20
 Part 2: "Anti-Boob Tubes," June 12, p. 30
 "Multiplexing Takes Off," June 26, p. 34
 "Technology's Privileged Offspring," Sept. 18, p. 199
 "Taming the Bomb," Oct. 16, p. 19
 "Take-Home Computer Terminals," Oct. 16, p. 52
 "The ABCs of CATV," Nov. 27, p. 20
 Knapp, Malcolm H., Donald R. Fairbanks, and Allan K. Lazarus—"Synthetic Lubricants," July 10, p. 140
 Koda, Arthur J.—"Mercury-Wetted Contact Relays," *Electric Controls Reference Issue*, Mar. 13, p. 40
 Kopecki, Ernest S.—"Formability of Stainless Steels," Feb. 6, p. 149
 Kron, H. O. and S. L. Crawshaw—"Gears," *Mechanical Drives Reference Issue*, Dec. 18, p. 19
 Krupka, R. M. and B. R. Mutyal—"Stress and Deflection," May 29, p. 129
 Kuehler, Theodore C.—"Clearance Seals," *Seals Reference Issue*, June 19, p. 13
 Kuhn, James P.—"Use Your QA Capabilities," Nov. 13, p. 174
 Kull, Francis R.—"Setscrews," *Fastening & Joining Reference Issue*, Sept. 11, p. 32

L

Landau, Ronald M.—"Engineering Standards for Small Companies," Oct. 16, p. 140
 Lavoie, Francis J.—"Signature Analysis: Product Early-Warning System," Jan. 23, p. 151
 "Neutron Radiography," Feb. 6, p. 138
 "Laser Welding," Feb. 20, p. 136
 "Beyond Integrated Circuits," Mar. 20, p. 180
 "Laser Provides New Data on Impact," Mar. 20, p. 212
 "Time-Sharing Goes Analog," Apr. 3, p. 131
 "Roll-Forming Gears," Apr. 17, p. 233
 "Programs for Hire," May 15, p. 132
 "Lending Engineers," May 29, p. 92
 "Batteries," June 12, p. 163
 "Explosive Welding," July 10, p. 125
 "Trends in Gearing," Aug. 7, p. 104
 "Nondestructive Testing," Sept. 4, p. 122
 "Computers: 1969-1980," Oct. 2, p. 106
 "3-D Graphics," Oct. 30, p. 84
 "Used Computers: Big-time data processing at bargain-basement prices," Nov. 27, p. 115
 "What's Ahead for Stamped Plastics," Dec. 11, p. 149
 "Minicomputers," Dec. 25, p. 54
 "Variable-Stroke Drives," *Mechanical Drives Reference Issue*, Dec. 18, p. 33
 "Fluid Couplings," *Mechanical Drives Reference Issue*, Dec. 18, p. 52
 "Electric Brakes," *Mechanical Drives Reference Issue*, Dec. 18, p. 57
 Lazarus, Allan K., Malcolm H. Knapp, and Donald R. Fairbanks—"Synthetic Lubricants," July 10, p. 140
 Leonard, Milton—"Trends in Electric Controls," *Electric Controls Reference Issue*, Mar. 13, p. 3
 "Proximity Switches," *Electric Controls Reference Issue*, Mar. 13, p. 21
 Licht, L. and A. Eshel—"Foil Bearings," May 15, p. 134

- Lippert, A. G. and T. P. Dankowski—"Computer Graphics"
Part 1: "The Engineer and the CRT Terminal," Apr. 17, p. 226
Part 2: "The Problems You Can Solve," May 1, p. 148
- Lipson, Charles—"Basic Course in Failure Analysis"
Lesson 1: "Failure of Parts," Oct. 16, p. 146
Lesson 2: "Planning For Strength," Oct. 30, p. 108
Lesson 3: "Failure Modes," Nov. 13, p. 222
Lesson 4: "Bending Fractures," Nov. 27, p. 140
Lesson 5: "Torsional Failures," Dec. 11, p. 186
Lesson 6: "Adhesive and Abrasive Wear," Dec. 25, p. 74
- Litant, Irving—"Conductive Plastics," Oct. 16, p. 168
- Lockwood, John P.—"Applying Snap-Acting Switches," Oct. 2, p. 122
- Lorvick, Robert R.
"High-Speed Gearing," Mar. 20, p. 186
"Base-Mounted Reducers," *Mechanical Drives Reference Issue*, Dec. 18, p. 38
- Loucks, John—"Mechanical Design of Permanent Magnets," July 24, p. 125
- Lujic, Ante—"Controlling Brushless D-C Motors," Oct. 30, p. 113
- Lynch, Gerald A. and Larry D. Mitchell—"Origins of Noise," May 1, p. 174
- Lynnworth, Lawrence C. and James J. Benes—"Measuring Temperature," Nov. 13, p. 190

M

- Malcolm, Glen—"Belt and Chain Drives," *Mechanical Drives Reference Issue*, Dec. 18, p. 27
- Mariowe, Donald E.—"The New Social Involvement," Sept. 18, p. 218
- Massey, Paul D.—"Cinch Nuts," *Fastening & Joining Reference Issue*, Sept. 11, p. 54
- Mathews, E. Al and G. R. McKillop—"Compression Packings," *Seals Reference Issue*, June 19, p. 35
- McCormick, H. E.—"Spiral-Wound Retaining Rings," *Fastening & Joining Reference Issue*, Sept. 11, p. 96
- McKillop, G. R. and Al Mathews—"Compression Packings," *Seals Reference Issue*, June 19, p. 35
- Metzger, Jack
"Checking Hydraulic System Performance," Feb. 6, p. 134
"Hydraulic System Maintenance," Mar. 20, p. 205
"Closed-Center Hydraulic Systems," Apr. 17, p. 239
"Hydraulic or Pneumatic," June 26, p. 128
"Synchronizing Hydraulic Cylinders," Aug. 21, p. 140
"Sequencing Hydraulic Cylinders," Nov. 13, p. 218
- Metzler, Albert—"Solid-State Relays," *Electric Controls Reference Issue*, Mar. 13, p. 35
- Mihaly, Michael F.—"Anchor Nuts," *Fastening & Joining Reference Issue*, Sept. 11, p. 51
- Miller, O. E.—"Wire-Formed Retaining Rings," *Fastening & Joining Reference Issue*, Sept. 11, p. 93
- Mitchell, Larry D. and Gerald A. Lynch—"Origins of Noise," May 1, p. 174
- Murdick, R. G. and D. W. Karger—"Need-To-Know for the Manager-In-Training," July 24, p. 98
- Mutyal, B. R. and R. M. Krupka—"Stress and Deflection," May 29, p. 129

N

- North, R. A. and John A. Quimby—"Diaphragm Seals," *Seals Reference Issue*, June 19, p. 56
- Nuernberger, Eldon L.—"V-Belts," *Mechanical Drives Reference Issue*, Dec. 18, p. 9

O

- Olson, Larry J.—"Trends in Mechanical Drives," *Mechanical Drives Reference Issue*, Dec. 18, p. 3
- Orgorkiewicz, R. M.
"Design for Battlefield Survival," Nov. 13, p. 36
"New Armor Materials," Nov. 27, p. 36
- Osgood, Carl C.—"High-Performance Bolt Material," May 1, p. 181

P

- Palkie, C. R.—"Vinyl Dispersion Coatings," Aug. 7, p. 115
- Parrish, F. W.—"Applying Power Logic-Tricks," Apr. 3, p. 149
- Patttee, H. E.—"Brazing and Brazing Alloys," *Fastening & Joining Reference Issue*, Sept. 11, p. 111
- Paulus, George—"Bonding Dry-Film Lubricants," Dec. 25, p. 68
- Pearce, Bert L.—"Chains," *Mechanical Drives Reference Issue*, Dec. 18, p. 5
- Pech, Joseph F.—"Electric Clutches," *Mechanical Drives Reference Issue*, Dec. 18, p. 47
- Petrie, E. M.—"High-Temperature Structural Adhesives," May 15, p. 174
- Petrus, Stephen and William A. Seitz
"Single-Thread Engaging Nuts," *Fastening & Joining Reference Issue*, Sept. 11, p. 48
"Caged Nuts," *Fastening & Joining Reference Issue*, Sept. 11, p. 53
"Spring Clips," *Fastening & Joining Reference Issue*, Sept. 11, p. 84
- Prahalis, C. P.—"Speech-Making for the Unaccustomed Engineer," Dec. 11, p. 146
- Prifogle, J. B.—"Picking a Power Cord," Dec. 11, p. 168
- Probert, Ralph E. and J. Vance Foster—"Armature Relays," *Electric Controls Reference Issue*, Mar. 13, p. 44

Q

- Quimby, John A. and R. A. North—"Diaphragm Seals," *Seals Reference Issue*, June 19, p. 56

R

- Rasmussen, Svein B.—"Practical Rotor Dynamics"
Part 1: "Geometric Properties of Rotors," Feb. 6, p. 142
Part 2: "Load/Deflection Relationship," Feb. 20, p. 157
Part 3: "Natural Frequencies & Critical Speeds," Mar. 6, p. 158

- Raudsepp, Eugene
"Games Engineers Play," Feb. 20, p. 130
"Engineers' Attitudes," June 12, p. 156
"Synetics," Oct. 16, p. 134
"What Causes Discontent?" Nov. 27, p. 109
"They'd Rather Stay than Switch," Dec. 25, p. 50
- Reid, H. F.—"Specifying Welding Electrodes," Feb. 6, p. 146
- Rice, Leslie R.—"Thyristors," *Electric Controls Reference Issue*, Mar. 13, p. 67
- Rieger, Neville F.—"Drive-Train Vibrations," July 10, p. 115
- Robbins, Paul H.—"The Engineer as a Professional," Sept. 18, p. 221
- Rosenberg, Roger L.—"Reed Relays," *Electric Controls Reference Issue*, Mar. 13, p. 38
- Ruder, William—"The Engineer's Image," Sept. 18, p. 225
- Rudy, John F.—"Welding and Welding Alloys," *Fastening & Joining Reference Issue*, Sept. 11, p. 104
- Ruffer, Walter F.—"Pressure Switches," *Electric Controls Reference Issue*, Mar. 13, p. 25
- Russo, Roland
"NEMA Control Relays," *Electric Controls Reference Issue*, Mar. 13, p. 50
"Contactors," *Electric Controls Reference Issue*, Mar. 13, p. 85

S

- Schaft, E. E.—"Resistance-Welded Fasteners," *Fastening & Joining Reference Issue*, Sept. 11, p. 38
- Schermerhorn, Robert S. and Martin I. Taft
"Minimizing Risk Factors in Design," Jan. 9, p. 120
"Decision-Making With Utility Theory," Feb. 6, p. 122
- Schwartz, N. J. and N. E. Taylor—"Circuit Breakers," *Electric Controls Reference Issue*, Mar. 13, p. 81
- Schwarzopf, D.—"Precision Snap-Acting Switches," *Electric Controls Reference Issue*, Mar. 13, p. 12
- Seitz, William A. and Stephen Petrus
"Single-Thread Engaging Nuts," *Fastening & Joining Reference Issue*, Sept. 11, p. 48
"Caged Nuts," *Fastening & Joining Reference Issue*, Sept. 11, p. 53
"Spring Clips," *Fastening & Joining Reference Issue*, Sept. 11, p. 84
- Shalkey, A. T., R. G. Bayer and A. R. Wayson—"Zero Wear," Jan. 9, p. 142
- Sharpe, Louis H.—"Adhesive Bonding," *Fastening & Joining Reference Issue*, Sept. 11, p. 119
- Shepler, Paul R.—"Split-Ring Seals," *Seals Reference Issue*, June 19, p. 16
- Singleton, Robert C.—"Arc-Welded Fasteners," *Fastening & Joining Reference Issue*, Sept. 11, p. 41
- Smith, Jerome F. and David M. Boreina—"Soldering and Soldering Alloys," *Fastening & Joining Reference Issue*, Sept. 11, p. 116
- Smoley, Earl M.
"Joint and Gasket Design," *Seals Reference Issue*, June 19, p. 61
"Gasket Materials and Forms," *Seals Reference Issue*, June 19, p. 67
- Spector, Leo
"Before It's Too Late, Denovate," Apr. 3, p. 20
"The Self-Cleaning Oven Derby," Apr. 17, p. 47
"The Entertaining Scoreboard," July 24, p. 39
"Photo Enlargements in a Minute," Sept. 18, p. 14
"Guidance System for Innovation," Sept. 18, p. 26
"Living With Runaway Technology," Sept. 18, p. 190
"Feeding People On The Go," Oct. 2, p. 20
"Hobbies for Engineers: Radio-Control Models," Nov. 13, p. 20
"Supertrap for Invisible Particles," Dec. 11, p. 40
"Think Games," Dec. 25, p. 28
- Sprow, Eugene—"Liquid Crystals—A Film In Your Future," Feb. 6, p. 34
- Stein, H. L.—"Sealants," *Seals Reference Issue*, June 19, p. 85
- Stevens, Justus B.—"Metal-Bellows Types," *Seals Reference Issue*, June 19, p. 32
- Steward, John H.—"Self-Piercing Nuts," *Fastening & Joining Reference Issue*, Sept. 11, p. 56
- Still, Jack H.—"Pulse Technology," Apr. 17, p. 246
- Strauss, Paul S.—"What's Your Job Satisfaction Quotient?" May 29, p. 97
- Strauss, Paul S. and Jack Carlock—"Common Sense Needs an Assist," July 24, p. 102
- Swieskowski, Henry—"Rectangular-Wire Spring Design," Aug. 21, p. 125

T

- Taft, Martin I. and Robert S. Schermerhorn
"Minimizing Risk Factors in Design," Jan. 9, p. 120
"Decision-Making With Utility Theory," Feb. 6, p. 122
- Tankus, Harry—"General Types," *Seals Reference Issue*, June 19, p. 24
- Taschenberg, Ernest—"Circumferential Seals," *Seals Reference Issue*, June 19, p. 21
- Taylor, N. E. and N. J. Schwartz—"Circuit Breakers," *Electric Controls Reference Issue*, Mar. 13, p. 81
- Taylor, O. L.—"How To Move Up Without Dropping Out," Oct. 2, p. 98
- Tribus, Myron—"Revolution in Engineering Education," Sept. 18, p. 215
- Tustin, Wayne—"Vibration Testing"
Part 1: "Instrument Selection," May 29, p. 116
Part 2: "Analysis of Complex Vibrations," June 12, p. 195
Part 3: "Avoiding Vibration Damage," June 26, p. 140
- Tyson, Samuel E.—"Simplifying The Selection of Stainless Steels," Oct. 2, p. 139

V

- Viscio, Donald P.—"Inserts," *Fastening & Joining Reference Issue*, Sept. 11, p. 59

W

- Wadlington, R. P.—"Packaged Adjustable-Speed Drives," *Mechanical Drives Reference Issue*, Dec. 18, p. 25
- Wagner, D. P. and T. P. Hurst—"Washers," *Fastening & Joining Reference Issue*, Sept. 11, p. 63
- Wallenhorst, R. G.—"Component Status Chart," Nov. 27, p. 111
- Wayson, A. R. and R. G. Bayer—"Designing for Measurable Wear," Aug. 7, p. 118
- Wayson, A. R., R. G. Bayer and A. T. Shalkey—"Zero Wear," Jan. 9, p. 142
- Webb, John—"Hollow Castings," Mar. 6, p. 130
- Weeton, John W.—"Fiber-Metal Matrix Composites," Feb. 20, p. 141
- Weinstein, Warren D.—"Microperformance of Metals," Dec. 11, p. 174
- White, H. A. and O. V. Gigliotti—"Magnetization of Permanent Magnets," July 24, p. 128
- White, Kenneth L.—"Precipitation-Hardening Stainless Steels," Jan. 23, p. 142
- White, Lloyd A.—"Meeting Methodology," June 12, p. 161
- Wilkinson, D. H.—"Radial Lip Seals," *Seals Reference Issue*, June 19, p. 5
- Wirry, Henry J.—"Torque Converters," *Mechanical Drives Reference Issue*, Dec. 18, p. 34
- Wise, Clare E. and Nat F. Wood—"Andy at Indy," May 15, p. 20
- Wise, Clare E.
- "Assault On the Sea," Apr. 17, p. 20
- "The Urban Mobility Hang-Up," Apr. 17, p. 36
- "Trip Guide To Apollo 10," May 15, p. 36
- "Design For Repairability," June 26, p. 20
- "Elation, Apprehension Stir Scientific Community on Eve of Apollo 11," July 10, p. 36
- "Twin Mariners Nearing Mars," July 24, p. 20
- "Product Safety," Aug. 7, p. 19
- "Lunar Experiments Promise Rich Return," Aug. 21, p. 31
- "Stripes, Scoops, and Spoilers—Signs of The Swinging '70s," Sept. 4, p. 20
- Wolosewicz, Dr. Ronald and T. E. Aaron—"Electrochemical Machining," Dec. 11, p. 160
- Wood, Nat F. and Robert Aronson—"Nerva—Key to Deep Space Flight," July 24, p. 24

- Wood, Nat F. and Clare E. Wise—"Andy at Indy," May 15, p. 20
- Wood, Nat F.
- "Piggyback Models Mimic Spacecraft," Jan. 9, p. 40
- "Weather," Mar. 6, p. 19
- "The Questionable Art of Alteration," Mar. 20, p. 33
- "Controlling Air Traffic—1: Crisis in Crowded Skies," May 1, p. 20
- "Steam," June 12, p. 20
- "The Automated Sky," Oct. 30, p. 19
- "X-15: Black Bullet that Paved a Path to the Moon," Nov. 27, p. 30
- "The Next Big Step: Stations in Space," Dec. 25, p. 20
- Wright, D. V. and R. L. Bannister—"Prognosis with Plastic Models" Part 1: "Vibration and Deflection Study," Aug. 21, p. 134
- Part 2: "Sealing and Fabrication," Sept. 4, p. 136
- Part 3: "Instrumentation for Dynamic Testing," Oct. 2, p. 128
- Part 4: "Material Properties and Sample Study," Oct. 16, p. 178
- Wroten, C. D.—"Pneumatic Line Losses," Dec. 11, p. 182
- Wurzel, Hugo—"Retaining Rings," *Fastening & Joining Reference Issue*, Sept. 11, p. 90

Y

- Young, William C. and Donald L. Kirkpatrick—"Dry-Lubricant Films," May 15, p. 163

Z

- Zais, Joseph J.—"Flat Belts," *Mechanical Drives Reference Issue*, Dec. 18, p. 15
- Zambetti, Frank—"Flexible Shafts," *Mechanical Drives Reference Issue*, Dec. 18, p. 70
- Zawacki, Stanley T.—"Making Meetings Count," Jan. 23, p. 130
- Zimmerman, Mark D.
- "Army Aims for Commonality: Universal Power Units," Nov. 13, p. 52
- "Escape Machines for all Seasons: ATVs," Dec. 11, p. 20

SUBJECT INDEX

Numbers preceding the column heads refer to the MACHINE DESIGN Subject Classification Systems (January 1970).

Editorial material in this section is classified according to the following system:

- | | 1 | 2 | 3 | 4 | 5 |
|--|------|--------------------------------|-----|-----|-------|
| Sensing Suddenness | | Kear | 8/7 | 132 | (4.0) |
| 1. Title. | | | | | |
| 2. Author's last name (see Author Index for complete name). Departments in regular issues are denoted by the following code: | | | | | |
| | N/T | News/Trends | | | |
| | Scan | Scanning the Field for Ideas | | | |
| | DIA | Design in Action | | | |
| | DI | Design International | | | |
| | CD | Conference Digest | | | |
| | AD | Abstracts for Design | | | |
| 3. Date of issue, MACHINE DESIGN Reference Issues are denoted by the following code: | | | | | |
| | EC | Electric Controls (March 13) | | | |
| | S | Seals (June 19) | | | |
| | F&J | Fastening & Joining (Sept. 11) | | | |
| | MD | Mechanical Drives (Dec. 18) | | | |
| 4. Page Number. | | | | | |
| 5. Number of pages in article or editorial item. | | | | | |

Electrical and Electronic Drives, Controls and Systems

11. Electric Motors

The Family Tree of Electric Motors....	Collins	1/9	152	(5.0)
Controlling Brushless D-C Motors.....	Lujic	10/30	113	(3.0)
The Polyphase Variable-Speed Commu- tator Motor	Dreisliker	7/10	130	(7.0)
Linear Motors Rotor-Lined Conveyor....	DI	11/13	57	(0.5)

12. Power Supplies

Hybrid Power System Promises Less Air Pollution	Article	12/11	18	(1.0)
Electric Cart Sheds Pounds of Batteries	N/T	2/6	14	(0.5)
Battery-Pressure Monitor Speeds Charging	Scan	9/4	117	(0.5)
30-Year Life Predicted for Lead-Acid Battery	N/T	10/2	10	(0.5)
Light Beam Rotation Couples Transform- er Windings	Scan	5/15	148	(1.0)
Oxygen Maker Not Winded After 11- Month "Sprint"	N/T	12/11	48	(0.5)

13. Switches and Relays

Service-Generator Circuit Protects Jet Wiring	Scan	4/17	261	(1.0)
Manual Switches	Bassett & Burt	EC 3/13	4	(8.0)
Mercury-Wetted Contact Relays	Koda	EC 3/13	40	(2.4)
Applying Snap-Acting Switches	Lockwood	10/2	122	(6.0)
Timing Switch Adjusts While Running...	Scan	4/17	262	(1.0)
Spring Tape Commutates Binary-Coded Miniswitch	Scan	12/11	158	(0.5)
Temperature Switches	Howard	EC 3/13	31	(4.0)
Pressure Switches	Ruffer	EC 3/13	25	(5.5)
Precision Snap-Acting Switches	Schwarzkopf	EC 3/13	12	(5.4)
Limit Switches	Farrow	EC 3/13	17	(4.3)
Proximity Switches	Leonard	EC 3/13	21	(3.8)
Fastest Light Switch Will Speed Up Computers	N/T	5/1	31	(0.8)
Pneumo-Mechanical Memory Sparkproofs Spraying	Scan	8/21	113	(0.6)
Stepping Switches	Dibbern & James	EC 3/13	47	(3.0)
Electromechanical or Solid State?	Beiling	6/24	122	(2.0)
Armature Relays	Foster & Probert	EC 3/13	44	(3.0)
Circuit Breakers	Schwartz & Taylor	EC 3/13	81	(4.0)
Sensing Suddenness	Kear	8/7	132	(4.0)
Reed Relays	Rosenberg	EC 3/13	38	(2.6)
Diaphragm Relay Challenges Reed-Switch Rival	Scan	10/16	154	(0.5)

14. Instruments and Controls

Trends in Electric Controls	Leonard	EC 3/13	3	(1.0)
Instrumentation Improves Look to Su- perconductivity	N/T	10/16	14	(0.5)
Technical Codes: The Language of Ma- chines	Bickford	9/4	108	(7.0)
Resistance Analyzers	Hornuth	7/10	136	(4.0)
Thermocouple Pyrometry	Hornuth	8/21	129	(6.0)
Measuring Temperature	Lynnworth & Benes	11/13	190	(15.0)
Sensing System Predicts Bridge Icing ...	Scan	3/20	211	(1.0)
X-Rays Sift Diamonds From Gravel Mix- ture	Scan	8/7	112	(0.5)
Heat-Shield Thermocouple Monitors as It Melts	Scan	12/11	155	(0.5)
Noncontact Temperature Measurements...	CD	6/26	144	(1.7)
NEMA Control Relays	Russo	EC 3/13	50	(4.0)
Contactors	Russo	EC 3/13	85	(2.0)
Pulse Operation of Solenoids	Allen	5/1	170	(4.0)
Timers	Article	EC 3/13	54	(5.0)
Counters	Bonneau	EC 3/13	59	(5.0)
Signature Analysis—Product Early-Warn- ing System	Lavole	1/23	151	(11.0)
High-Resolution Readouts	Karas	6/26	133	(7.0)
High-Fidelity Testing	Khol	6/26	107	(6.0)
Mobile Printer Cured of Noise-Induced "Acne"	Scan	11/13	186	(0.7)
The Entertaining Scoreboard	Spector	6/24	39	(3.0)
Wire Forest Freezes 3-D Plot	Scan	4/3	134	(1.0)
Servo Control Stretches Readout Scale...	Scan	5/29	111	(0.6)
Twisting Jet Tube Forms Low-Inertia Recorder Pen	Scan	12/11	156	(0.5)
Baby Breath Monitor	DI	11/13	56	(0.5)
Thin Rotor Perks up Servomotor Startup	Scan	10/16	152	(0.5)
Four Extra Rotors Improve Stepper-Mo- tor Act	Scan	4/17	258	(1.0)

15, 16. Circuit Components, Connectors and Wiring

Pulse Technology	Still	4/17	246	(12.0)
Squeezed Tape Monitors Level or Position	Scan	8/21	115	(0.6)
Solid-State Relays	Metzler	EC 3/13	35	(3.0)
Electromechanical or Solid State?	Beiling	6/24	122	(2.0)
Basic Course in Integrated Circuits:				
Lesson 7: Characteristics of Digital ICs	Hibberd	1/9	157	(4.0)
Lesson 8: Families of Digital ICs.....	Hibberd	1/23	163	(8.0)
Lesson 9: Elements of Linear ICs	Hibberd	2/6	153	(6.0)
Lesson 10: Basic Types of Linear ICs	Hibberd	2/20	169	(6.0)
Lesson 11: Standard Digital ICs	Hibberd	3/6	149	(9.0)
Lesson 12: Standard MOS and Linear ICs	Hibberd	3/20	215	(5.0)
Lesson 13: Integrated Electronic Cir- cuits	Hibberd	4/3	155	(7.0)
Lesson 14: IC Applications, Present and Future	Hibberd	4/17	263	(7.0)
Lesson 15: ICs in Industrial Control...	Hibberd	5/1	187	(7.0)
Switching Transistors	Jaibert	EC 3/13	64	(3.0)
Thyristors	Rice	EC 3/13	67	(4.0)
Digital Integrated Circuits	Crews	EC 3/13	71	(6.2)
Packaged Discrete Modules	Doane	EC 3/13	77	(3.5)
Beyond Integrated Circuits	Lavole	3/20	181	(6.0)
Applying Power Logic-Triacs	Parrish	4/3	149	(6.0)
All Circuit Components Fitted Into "Zero" Space	N/T	10/2	18	(1.0)
Iris Mask, HT Glass Brighten Color TV	N/T	7/10	10	(0.6)
Laser Provides New Data on Impact...	Lavole	3/20	212	(3.0)
Using Lasers For Dynamic Measure- ments CD	CD	11/13	228	(2.0)
Picking The Right Connector	Corrigan & Elchenseer	2/20	162	(5.0)
Designing Printed Wiring Boards	Cavasin	1/23	133	(6.0)
Computer Matches Designer, Methods Man As Working Team	Khol	3/8	127	(3.0)
Picking a Power Cord	Prifogle	12/11	168	(6.0)
Buried A-C Superconductor	N/T	6/24	31	(2.0)
Documenting Printed-Wiring Packages...	Jacobs	5/15	166	(8.0)

17. General Components

Mechanical Design of Permanent Magnets	Loucks	6/24	124	(4.0)
Magnetization of Permanent Magnets...	White & Gigliotti	6/24	128	(4.0)
Electrostatic Forces Called on to Solve Space Problems	N/T	12/11	10	(0.5)
Subminiature Lamps	Curran	11/27	134	(6.0)
Light From Explosion Separated From Blast	N/T	2/6	12	(0.5)
Sculptured Headlight Beam Dodges On- coming Traffic	Scan	1/23	141	(1.0)
Spacecraft to Get Indestructible Heat Source	N/T	12/11	14	(0.5)
Avoiding Cold Spots Along the Wall of a 747	Scan	6/26	132	(0.5)
A Toast To A Toaster Toaster	Scan	5/15	153	(1.0)
Magnetic Couplings	Gaster	4/3	147	(2.0)
Brakes: Electric Brakes	Lavole	MD 12/18	57	(2.3)
Clutches: Electric Clutches	Pech	MD 12/18	47	(4.3)

19. Systems, Drives, Assemblies

Adaptive Control Toward The Thinking Machine	Khol	5/1	156	(14.0)
Controlling Brushless D-C Motors	Lujic	10/30	113	(3.0)
Radio-Control Models	Spector	11/13	20	(8.0)
Crisis In Crowded Skies: Part I—Con- trolling Air Traffic	Wood	5/1	20	(7.0)
The Automated Sky	Wood	10/30	19	(9.0)
Parenteses Propel Platform	N/T	10/30	34	(1.0)
Self-Test Circuit Monitors Recorder Op- eration	N/T	11/27	15	(0.6)
Take-Home Computer Terminals	Scan	5/1	181	(0.5)
Time-Sharing Goes Analog	Klein	10/16	52	(4.0)
Computers: 1989-1990	Lavole	4/3	131	(3.0)
Used Computers: Big-Time Data Process- ing at Bargain-Basement Prices...	Lavole	10/2	106	(11.0)
Minicomputers	Lavole	11/27	114	(6.0)
Quickly and Continuously Drawing Con- verted To Tape	Lavole	12/25	54	(7.0)
Machines Are Learning To Learn By Ex- perience	N/T	8/7	44	(0.6)
Computer On The Counter	N/T	11/13	18	(0.5)
Programs for Hire	(Article)	5/1	32	(2.0)
Self-Healing Computer Ready for Space	Lavole	5/15	132	(6.0)
Electric Eyes Monitor Tape Wander...	N/T	10/2	12	(0.7)
	Scan	1/9	132	(1.0)

Fluid Drives, Controls and Systems

21, 22. Fluids, Fluid Conditioners

Hydraulic Effects in Fluidics and Piping	CD	3/20	221	(2.0)
Controlling Hydraulic Contamination	CD	10/30	124	(2.0)
The Climate Control Machine	N/T	2/6	42	(2.0)
New Process Promises Clean Water At Low Cost	N/T	10/30	14	(0.5)
Collapsible Tank Provides Key to Oil-Pollution Control	N/T	12/11	12	(0.9)
Controlling Hydraulic Contamination	CD	10/30	124	(2.0)
Hydraulic System Design	Kauffman	10/30	116	(5.0)
Cooling Enclosed Electronics	Hay	3/6	140	(4.0)

24. Linear Devices

Synchronizing Hydraulic Cylinders	Metzger	8/21	141	(4.0)
Sequencing Hydraulic Cylinders	Metzger	11/13	218	(4.0)
Simple Pump Moves Human Blood	N/T	12/25	14	(0.6)
Side-Stepping Bellows Shuffle Heavy Loads	Scan	8/21	111	(1.0)
Punch Puller Pierces Panel Ports	Scan	5/29	113	(1.0)
Coanda Effect Moves Out to Sea	Scan	10/30	107	(0.6)

25. Rotary Devices

Spacer Ring Freezes Pump-Vane Clearances	Scan	3/6	145	(0.6)
Drinking Water Pumped Over Mountains	N/T	5/15	42	(0.7)
Powered Hinge Battens the Hatches	Scan	2/6	131	(1.0)

26. Seals, Packings, Gaskets

Trends in Sealing	Dega	8/6/19	3	(2.0)
Diaphragm Seals	North & Quimby	8/6/19	54	(5.0)
Exclusion Devices	Izenbarger	8/6/19	11	(3.0)
Radial Lip Seals	Wilkinson	8/6/19	5	(5.0)
Ring Seals: Split-Ring Seals	Shepler	8/6/19	16	(7.7)
Ring Seals: Circumferential Seals	Taschenberg	8/6/19	21	(7.7)
Clearance Seals	Kuchler	8/6/19	13	(3.0)
Face Seals: Metal-Bellows Types	Stevens	8/6/19	32	(11.0)
Face Seals: General Types	Tankus	8/6/19	24	(11.0)
Metallic Gaskets: General Types	Dunkle	8/6/19	76	(9.0)
Metallic Gaskets: O-Ring Types	Gastineau & Kalasky	8/6/19	83	(9.0)
Nonmetallic Gaskets: Elastomeric O-Rings	Gillette & Everett	8/6/19	73	(15.0)
Nonmetallic Gaskets: Gasket Materials and Form	Smoley	8/6/19	67	(15.0)
Nonmetallic Gaskets: Joint and Gasket Design	Smoley	8/6/19	61	(15.0)

Compression Packings	Mathews & McKillop	8/6/19	35	(5.0)
Molded Packings: Lip Types	Boyce	8/6/19	40	(16.0)
Molded Packings: Felt Radial Types	Chapter	8/6/19	54	(16.0)
Molded Packings: Squeeze Types	Gillette & Everett	8/6/19	47	(16.0)

27. Valves

Bouncing Ball Checks Transmission Leaks	Scan	3/20	208	(1.0)
Eccentric Plug Improves Valve Characteristics	Scan	4/3	136	(0.5)
Fuel Injection Is Ready	(Article)	10/30	36	(2.7)

28. Instruments and Controls

A-C Fluidics	Khol	2/6	126	(5.0)
Fluidic Gate/Logic System Inspects Parts	Scan	3/6	148	(1.0)
Fluidic Governor Reads Air-Motor Ripple	Scan	10/16	152	(0.5)
Power Diaphragms Double as Poppets	Scan	11/27	130	(0.6)
Video Signal Orients Jet-Set Characters	Scan	10/2	118	(0.5)

29. Systems and Assemblies

Analyzing Hydraulic Circuits	Esposito	10/16	173	(5.0)
Hydraulic Or Pneumatic	Metzger	6/26	126	(4.0)
Checking Hydraulic System Performance	Metzger	2/6	134	(4.0)
Hydraulic System Design	Kauffman	9/4	118	(3.0)
Hydraulic System Design	Kauffman	10/2	134	(5.0)
Hydraulic System Design	Kauffman	10/30	116	(5.0)
Hydraulic System Design, Part 4: Machine-Tool Traverse and Feed Circuits	Kauffman	11/27	144	(6.0)
Control of Machine-Tool Feed	Kauffman	12/25	78	(6.0)
Hydraulic System Maintenance	Metzger	3/20	205	(3.0)
Closed-Center Hydraulic Systems	Metzger	4/17	239	(7.0)
Synchronizing Hydraulic Cylinders	Metzger	8/21	141	(4.0)
Sequencing Hydraulic Cylinders	Metzger	11/13	218	(4.0)
Pneumatic Line Losses	Wroten	12/11	182	(4.0)
Hybrid Controls Speed Up Machining	Scan	3/6	146	(1.0)
Puff the Pneumatic Label Sticker	Scan	8/7	113	(0.7)
Gas-Powered Pump Boosts Its Own Pressure	Scan	8/21	114	(0.6)
Cable-Snapping Tongs Pacified by Hydraulics	Scan	12/25	65	(1.0)
Resonant Hydraulics Blow High-Speed Bubbles	Scan	12/25	66	(1.0)
Double-Action Flapper Stops Truck Tilting	Scan	8/7	111	(1.0)
Speed Check Controls Skidless Braking	Scan	12/11	157	(0.5)
Packaged Adjustable-Speed Drives: Torque Converters	Witty	MD 12/18	34	(3.5)
Silo Rescues Oil From Hostile Engine	Scan	12/11	158	(0.5)

Mechanical Drives, Controls and Systems

31. Engines, Atomic Power, Power Sources

Trends in Mechanical Drives	Olson	MD 12/18	3	(2.0)
Why Nothing Will Replace The Internal-Combustion Engine	Wise	5/29	39	(4.4)
At Future Indy-500s, Public Will See Nothing New	N/T	9/18	18	(0.5)
Jets Quieted By Noise Absorbing Ducts	N/T	5/1	10	(0.5)
Fuel Injection Is Ready	(Article)	10/30	36	(2.7)
A Rotary Engine That Doesn't Rotate	Scan	5/1	179	(1.0)
Glass-Ceramic Regenerator Impresses Gas-Turbine Designers	N/T	5/15	18	(0.6)
SNAP-8 Reaches Program Goal	N/T	10/2	10	(0.5)
NERVA—Key To Deep Space Flight	Aronson	8/24	24	(4.0)
Taming the Bomb	Klein	10/16	19	(10.0)
Ear-Ring Rocket Will Nudge Big Spacecraft Back On Course	N/T	10/30	14	(0.6)
Smokeless Propellant Sneaks Missile Away	N/T	10/30	40	(0.5)
Utility Will Field Fleet of Gas/Gas Cars	Wood	2/20	31	(3.0)
Has Bill Lear Run Out of Steam? Well Not Exactly	Wise	12/11	34	(3.0)
Steamer Assaults Speed Record	N/T	11/13	14	(1.3)

32-34. Drives, Transmissions, Drive Components

Speed Reducers: Shaft-Mounted Reducers	Chung	MD 12/18	41	(1.5)
Speed Reducers: Base-Mounted Reducers	Lorvick	MD 12/18	38	(3.2)
Dual Bearings Control Turntable Torque	Scan	11/27	132	(0.7)

Packaged Adjustable-Speed Drives: Belt and Chain Drives	Malcolm	MD 12/18	27	(3.1)
Packaged Adjustable-Speed Drives: Belt and Chain Drives	Malcolm	MD 12/18	27	(3.1)
Packaged Adjustable-Speed Drives: Friction and Traction Drives	Burnett	MD 12/18	30	(2.7)
Packaged Adjustable-Speed Drives: Gear Drives	Wadlington	MD 12/18	25	(2.4)
Torque-Sensing Spring Shifts Transmission	Scan	4/3	137	(0.6)
Packaged Adjustable-Speed Drives: Variable-Stroke Drives	Lavole	MD 12/18	33	(1.0)
Roller Chain Ratings	Hofmeister	5/29	125	(4.0)
Chains	Pearce	MD 12/18	5	(4.0)
Split-Chain Loader Helps Feed Jumbo V-Belts	Scan	11/27	128	(1.0)
Fiat Belts	Nuernberger	MD 12/18	9	(6.0)
Analytically Magnified Gear Tooth Profiles	Zaliss	MD 12/18	15	(4.0)
Gears	Breur	2/20	167	(2.0)
Trends in Gearing	Crawshaw & Kron	MD 12/18	19	(6.0)
High-Speed Gearing	Lavole	8/7	104	(7.0)
Roll-Forming Gears	Lorvick	3/20	186	(5.0)
Drive-Train Vibrations	Lavole	4/17	233	(6.0)
Forecasting Gear Failure	Rieger	7/10	115	(5.0)
Worm Cuts Its Own Gear Teeth	CD	5/15	181	(1.8)
Chains	Scan	6/24	117	(1.0)
V-Belts	Pearce	MD 12/18	5	(4.0)
	Nuernberger	MD 12/18	9	(6.0)

35. Rotational Components

Bearing-Life Equations Don't Reflect Advances	N/T	5/15	40	(0.6)
Linear Bearing Cuts Prop Slop	Scan	10/16	154	(0.5)
Flat-Pad Thrust Bearings	Elwell & Booser	9/4	141	(6.0)
Foil Bearings	Licht & Eshel	5/15	154	(9.0)
Couplings	Grundtner			
	MD	12/18	60	(6.0)
Flexible Shafts	Zambetti			
	MD	12/18	70	(3.0)
Universal Joints	(Chapter)			
	MD	12/18	66	(4.0)
Fluid Couplings	Lavoie	MD	12/18	52 (2.0)
Crankshaft/Gear Arrangement Eliminates Connecting-Rod Wobble	Scan	1/23	139	(1.0)
Clutches: Mechanical Clutches	Cozzarin			
	MD	12/18	43	(4.5)
Brakes: Mechanical Brakes	Dombeck			
	MD	12/18	54	(3.5)
Braking Study Seeks Best Runway	N/T	10/30	44	(0.7)

Braked Pivot Stops Trailer Jackknifing..	Scan	6/26	130	(1.0)
Spring Combination Renders Clutch Torque-Sensitive	Scan	1/9	131	(1.0)
Toggle Mechanism Monitors Clutch Torque	Scan	2/6	133	(0.5)
Nuclearly Ionized Air Blows Away Static	Scan	10/2	120	(0.7)

36. Mechanisms

"Custom-Designed" Cams Realign Crooked Type	Scan	10/16	155	(0.5)
Nonlinear Cam Tailors Controller Gain	Scan	10/30	104	(1.0)
Cable-Snapping Tongs Pacified by Hydraulics	Scan	12/25	65	(1.0)
Tapered Ribs and Captive Rollers Wipe Out Backlash	Scan	10/30	106	(0.5)
Wire is the Medium, Weights are the Message	Scan	11/13	181	(1.0)
Air-Liquid Transfer Arms Booby Trap	Scan	11/13	188	(0.5)

Assembly Components

41. Fasteners

How Fasteners Are Made	Baumgartner	1/9	136	(6.0)
High-Performance Bolt Materials	Osgood	5/1	184	(3.0)
Trends in Fastening and Joining	(Chapter)			
	F&J	9/11	3	(1.0)
Inserts	F&J	9/11	59	(4.0)
Captive or Self-Retaining Nuts: Anchor Nuts	Mihaly	F&J	9/11	51 (7.8)
Captive or Self-Retaining Nuts: Caged Nuts	Seitz & Petrus	F&J	9/11	53 (7.8)
Captive or Self-Retaining Nuts: Clinch Nuts	Massey	F&J	9/11	54 (7.8)
Captive or Self-Retaining Nuts: Self-Piercing Nuts	Steward	F&J	9/11	56 (7.8)
Single-Thread Engaging Nuts	Seitz & Petrus			
	F&J	9/11	48	(3.0)
Pin Fasteners	Braendel	F&J	9/11	70 (4.8)
Double Nut Fights Structural Fatigue	Scan	5/15	152	(0.6)
Quick-Operating Fasteners	Barry	F&J	9/11	101 (3.0)
Retaining Rings: Stamped Retaining Rings	(Chapter)			
	F&J	9/11	90	(6.0)
Retaining Rings: Wire-Formed Retaining Rings	Miller	F&J	9/11	93 (6.0)
Spiral-Wound Retaining Rings	McCormick			
	F&J	9/11	96	(4.6)
Flush Fastener Fights Fatigue Failure	Scan	5/1	183	(0.7)
Blind Rivets	(Chapter)			
	F&J	9/11	81	(3.0)
Small Rivets	(Chapter)			
	F&J	9/11	75	(5.6)
Setscrews	Kull	F&J	9/11	32 (4.0)

Studs	(Chapter)			
	F&J	9/11	36	(2.0)
Tapping Screws	(Chapter)			
	F&J	9/11	27	(5.0)
Dead Thread Comes Back to Haunt Lockwasher	Scan	12/11	155	(0.5)
Washers	Hurst & Wagner	F&J	9/11	63 (3.0)
V-Band Couplings	Goldberg	4/3	138	(4.0)
Locking Fasteners	(Chapter)			
	F&J	9/11	44	(4.0)
Spring Clips	Seitz & Petrus	F&J	9/11	84 (6.0)
Sealing Fasteners	(Chapter)			
	F&J	9/11	66	(3.8)

42, 43. Springs & Isolation Devices, Misc.

Designing Torsion Springs	Blandino	3/6	134	(6.0)
Flexing Fingers Pluck Curly Cards	Scan	8/21	112	(0.6)
Pneumatic Barge Coupling Tames Wave Effects	Scan	3/20	209	(0.6)
Bounce Chamber Levels Hydraulic-Shock Peaks	Scan	6/24	120	(0.7)
Bumper Banks on Torsion-Bar Deformation	Scan	7/10	120	(0.7)
Equalized Deflections Tune Shock-Mounted Panels	Scan	7/10	121	(1.0)
Rectangular-Wire Spring Design	Swieskowski	8/21	125	(3.0)
Flip-Flop Requires Alternate Keys	Scan	11/13	185	(0.5)
Matching Flats Trip Rocking Lock	Scan	11/27	129	(0.6)
Bowed Roll Twins Separate Slit Web	Scan	2/6	133	(0.5)
Golf-Cart Meter Calls Your Shots	Scan	7/10	124	(0.7)

Materials

51, 52. Ferrous, Nonferrous Metals

Materials	(Chapter)			
	F&J	9/11	4	(4.8)
Precipitation-Hardening Stainless Steels	White	1/23	142	(8.0)
Formability of Stainless Steels	Kopecki	2/6	149	(4.0)
Simplifying the Selection of Stainless Steels	Tyson	10/2	139	(3.0)
Trim Protects Car From Rust	N/T	11/13	18	(0.5)
Ultrasonic Testing of High-Strength Alloys	CD	3/6	164	(2.5)
Parts From Aluminum Powder	Khol	7/10	110	(5.0)
Copper Beats Out Steel In Saturn Injector	Rudy	6/24	121	(0.8)
Designing With Titanium	CD	12/11	190	(1.5)
Hard Chromium	Hart	5/15	144	(4.0)

53, 54. Plastics, Rubber & Elastomer

Structural Behavior of Plastics	CD	7/10	152	(2.4)
Fortified Thermoplastics	Jones	11/13	205	(3.0)
What's Ahead for Stamped Plastics	Lavoie	12/11	149	(5.0)
Mechanical Applications For Filled TFE	CD	1/9	162	(2.0)
New Developments in Contact Bearings	CD	6/24	134	(2.3)
Plastic Carb Keeps Its Cool	Scan	6/24	118	(0.7)
Mechanical Applications for Filled TFE	CD	1/9	162	(2.0)
Conductive Plastics	Lilant	10/16	168	(5.0)

55, 56. Joining Materials, Other Nonmetals

High-Temperature Structural Adhesives	Petrie	5/15	175	(5.0)
Adhesive Bonding	Sharpe	F&J	9/11	119 (9.8)
Sealants	Stein	8/6	19	85 (10.0)
Welding and Welding Alloys	Rudy	F&J	9/11	104 (6.8)
Brazing and Brazing Alloys	Pattee	F&J	9/11	111 (4.6)
Soldering and Soldering Alloys	Smith & Borchia	F&J	9/11	116 (3.0)
Fluorine Doesn't Bother Glassy Carbon	N/T	12/25	12	(0.5)

For Boeing's 747: 7-Ply Windshield 2 In. Thick	N/T	4/17	14	(0.5)
Designing With Felt	Becker	6/26	113	(13.0)
Polywater: It Freezes At -40 C, Boils At 500	N/T	8/7	14	(0.5)

57. Finishes, Coatings, Lubricants

Finishes and Coatings	(Chapter)			
	F&J	9/11	9	(3.0)
'Umbrella' Found For Supersonic Rain	N/T	9/18	34	(0.5)
Vinyl Dispersion Coatings	Palkie	8/7	115	(3.0)
Teflon-S: Tough Skin for Slippery Parts	N/T	2/20	40	(2.0)
Nonspray Plastic Coatings	CD	2/6	160	(2.0)
Synthetic Lubricants	Fairbanks, Knapp & Lazarus	7/10	140	(9.0)
Dry-Lubricant Films	Kirkpatrick & Young	5/15	163	(3.0)
Bonding Dry-Film Lubricants	Paulus	12/25	68	(6.0)
Accelerating Lubricants Tests	CD	10/16	188	(2.2)
Sputtering Solid Lubricants	CD	12/25	86	(1.0)

58. Prefabricated Forms

Fiber-Metal Matrix Composites	Weeton	2/20	141	(16.0)
The Composite Aircraft	N/T	9/4	18	(1.0)
Joining Fiber-Reinforced Composites	CD	5/1	194	(2.4)
Composite Material Beef up Chopper	Scan	8/7	112	(0.5)
Joining Metal Tubing	(Article)	12/25	61	(4.0)
Jack-in-the-Box Mast Snaps Into Shape	Scan	12/11	154	(1.0)

Manufacturing Methods and Processes

61-63. Metals Casting, Shaping, Forming

Hollow Castings	Webb	3/6	130	(4.0)
Designing With Titanium	CD	12/11	190	(1.5)
Plastic Moldings—or Metal Die Castings?	Dreger	6/24	113	(4.0)
"Machined Forgings" Produced by New Metal-Forming Process	N/T	10/30	10	(0.7)
165-mm Projectile Cold Extruded from Steel Disc	N/T	9/18	18	(0.5)
Forged Powder Metal	Khol	4/3	142	(5.0)
Precision Controls Developed for P/M Parts	N/T	11/13	34	(0.7)
High Pressure Forming	Khol	1/9	124	(7.0)
Formability of Stainless Steels	Kopecki	2/6	149	(4.0)
Panel Joiner Zips Up Metal Roof Tin-Can Tight	Scan	5/29	110	(1.0)
What's Ahead for Stamped Plastic	Lavoie	12/11	149	(5.0)

64-66. Metals Joining, Removal, Treating

Welding and Welding Alloys	Rudy	F&J 9/11	104	(6.8)
Joining Metal Tubing	(Article)	12/25	61	(4.0)
Trends in Fastening and Joining	Chapter F&J 9/11	3	(1.0)	
Specifying Welding Electrodes	Reid	2/6	146	(3.0)
Assembly-Line Shipyard Builds Warships Upside Down	N/T	4/3	12	(0.6)
Arc-Welded Fasteners	Singleton	F&J 9/11	41	(3.0)
Resistance-Welded Fasteners	Schaft	F&J 9/11	35	(2.8)

Smallest Laser Weld Created On Production Line

Laser Welding	N/T	1/9	12	(0.5)
Explosive Welding	Lavoie	2/20	136	(5.0)
Brazing Technique Solves Aluminum-Radiator Problems	Lavoie	7/10	125	(5.0)
Brazing and Brazing Alloys	N/T	2/6	12	(0.5)
Soldering and Soldering Alloys	Pattee	F&J 9/11	111	(4.6)
Bonding Dry-Film Lubricants	Smith & Borcina	F&J 9/11	116	(3.0)
Adhesive Bonding	Paulus	12/25	65	(6.0)
Fastening Plastics to Nonplastics	Sharpe	F&J 9/11	119	(0.8)
Multidirectional Drill Motion Cuts Machining Time	CD	4/17	308	(2.6)
Wire-Screen Grinder Machine "Anything"	Scan	5/15	151	(0.8)
Electrochemical Machining	N/T	11/27	12	(0.5)
Flexibility Added to Electrochemical Machining	Aaron & Wolosewicz	12/11	160	(8.0)
	N/T	11/13	10	(0.5)

67-69. Metals Finishing, Plastics Processes

Finishes and Coatings	Chapter F&J	9/11	9	(3.0)
Designing Plated Plastic Parts	CD	2/20	178	(3.0)
Robot Speeds Production of Blast-Coated Parts	N/T	2/23	12	(0.7)
Plastic Moldings—or Metal Die Castings? "Impossible" Parts Produced by Rotational Molding	Dreger	6/24	113	(4.0)
Automatic Assembly	N/T	10/2	49	(1.7)
Automatic Assembly	Benes	3/20	191	(14.0)
Automatic Assembly	Benes	F&J 9/11	129	(3.0)

Design Theory and Techniques

71-73. Mechanics, Strength of Materials and Parts

International Mechanisms Group Established	N/T	10/30	42	(0.7)
Practical Rotor Dynamics—1: Geometric Properties of Rotors	Rasmussen	2/6	142	(4.0)
Practical Rotor Dynamics—Part 2: Load/Deflection Relationship	Rasmussen	2/20	157	(5.0)
Practical Rotor Dynamics—Part 3: Natural Frequencies & Critical Speeds	Rasmussen	3/6	158	(5.0)
Instrument Selection	Tustin	5/29	117	(9.0)
Avoiding Vibration Damage	Tustin	6/26	140	(4.0)
Prognosis With Plastic Models	Wright & Bannister	8/21	135	(5.0)
Missile Maker Minors In Music	N/T	4/17	10	(0.6)
Origins of Noise	Mitchell & Lynch	5/1	174	(5.0)
Fastener Evaluation	Brenner F&J	9/11	24	(2.6)
Stress and Deflection	Krupka & Mutyala	5/29	129	(4.0)
Basic Course In Failure Analysis	Lipson	10/16	146	(5.0)
Planning for Strength	Lipson	10/30	108	(5.0)
Microperformance of Metals	Weinstein	12/11	174	(8.0)
Basic Course In Failure Analysis—Failure Modes	Lipson	11/13	222	(4.0)
Damage-Tolerant Design	Osgood	10/30	91	(5.0)
Sagging Pressure Reveals a Giant Case of Fatigue	Scan	10/16	151	(1.0)
Why Fasteners Fail	CD	4/3	162	(2.0)
Selecting Materials to Resist Fatigue	CD	9/4	150	(1.7)
Laser Provides New Data on Impact-Zero Wear	Lavoie	3/20	212	(3.0)
Designing for Measurable Wear	Bayer, Shalkey & Wayson	1/9	142	(10.0)
Adhesive and Abrasive Wear	Bayer & Wayson	8/7	118	(10.0)
Pneumatic Line Losses	Lipson	12/25	74	(4.0)
Damage-Tolerant Design	Wroten	12/11	182	(4.0)
Joint Design	Osgood	10/30	91	(5.0)
Designing Tapered Beams	(Chapter) F&J 9/11	12	(12.0)	
Bending Fractures, Lesson 4	CD	10/2	144	(3.0)
Stress In Noncircular Shafts	Lipson	11/27	140	(4.0)
Torsional Failures, Lesson 5	Hassoun	6/24	132	(2.0)
	Lipson	12/11	186	(4.0)

74. Human Factors Engineering

Machines That Teach—Part 1	Klein	5/29	21	(8.0)
Feeding People On The Go	Spector	10/2	20	(10.0)
Common Sense Needs An Assist	Strat & Carlock	6/24	102	(4.0)
Human Factors Checked Out In DSSV Test	N/T	1/23	10	(0.8)
Human Factors Experts Probe for New Truck-Cab Efficiencies	N/T	3/6	48	(1.0)

Lifting Rubber Fingers Curl, Squeeze, and Hold

"Sea of Tranquility" for Earthlings With Users	N/T	10/16	10	(0.8)
Off-The-Shelf Underwater Habitat	Scan	10/2	117	(1.0)
Elastic Dummy Will Eject From Jets	N/T	11/27	42	(1.0)
Product Safety	N/T	12/11	10	(0.5)
Pumped-Up Helmets Guard the Gridiron	Wise	8/7	19	(15.0)
Greats	(Article)	10/16	36	(2.0)
Nobody Knows About Household Accidents When Cars Crash, Bumper Absorbs Collision	N/T	6/26	10	(0.5)
From Door Ramblings, New Safety Standards?	N/T	9/4	10	(1.0)
Commentary Continues	N/T	10/16	14	(0.5)
Books on Tape and TV-Eye Backpack	N/T	12/25	8	(1.0)
Optimizing Working Environments	N/T	5/1	14	(1.2)
Squishy Shoe Lining Distributes Foot Forces	CD	11/27	150	(1.7)
	Scan	12/11	156	(0.5)

75. Design Analysis and Synthesis

Organizing Design Problems	Burgess	11/27	120	(8.0)
3-D Graphics	Lavoie	10/30	84	(7.0)
Component Status Chart	Wallenhorst	11/27	111	(3.0)
Product Planning by Computer	Correns	1/23	161	(2.0)
Systematic Subjectivity: Decision-Making With Utility Theory	Schermerhorn & Taft	2/6	122	(4.0)
Analog Simulator	Cook & Hultin	8/7	128	(4.0)
Radio-Control Models	Spector	11/13	20	(8.0)
Hobbies for Engineers: Think Games	Spector	12/25	28	(3.0)
Piggyback Models Mimic Spacecraft	Wood	1/9	40	(4.0)
Prognosis With Plastic Models	Wright & Bannister	8/21	135	(5.0)
Prognosis With Plastic Models	Wright & Bannister	9/4	136	(5.0)
Prognosis With Plastic Models	Wright & Bannister	10/2	128	(6.0)
Prognosis With Plastic Models	Wright & Bannister	10/16	178	(8.0)
Mountain Models: New Tool for Antenna Designers	N/T	6/26	18	(0.5)
Advanced Simulator Files Any Combat Mission Realistically	N/T	11/13	64	(0.7)
Elastic Dummy Will Eject From Jets	N/T	12/11	10	(0.5)
Computer Graphics:				
Part 1—The Engineer and the CRT Terminal	Dankowski & Lippert	4/17	226	(7.0)
Part 2—The Problems You Can Solve	Dankowski & Lippert	5/1	145	(8.0)
Computer Matches Designer, Methods Man As Working Team	Khol	3/6	127	(3.0)
From Computer to Microfilm—Nonstop	N/T	1/23	18	(3.0)
Use Your QA Capabilities	Kuhn	11/13	174	(6.0)
Estimating Service Life	CD	5/29	136	(2.0)

An Aerospace Industry Report on TPD	Black	3/20	177	(3.0)
Systematic Subjectivity: Minimizing Risk	Schermerhorn &			
Factors in Design	Taft	1/9	120	(4.0)
Design for Repairability	Wise	6/26	20	(7.0)

76, 77. Basic Sciences, Experimental, Advanced Design

The Electric Brain	Khol	5/29	103	(8.0)
Lunar Experiments Promise Rich Return	Wise	8/21	30	(4.0)
Supercooled Atom-Smashing Electron				
Racetrack	Spector	3/6	42	(1.0)
Supertrap for Invisible Particles	Spector	12/11	40	(4.0)
Measuring Temperature	Lynnworth &	11/13	190	(15.0)
Liquid Crystals—A Film in Your Future?	Sproy	2/6	34	(6.0)
Neutron Radiography	Lavole	2/6	138	(4.0)
Pressure Erases Damage To Irradiated				
Metal	N/T	4/17	12	(0.5)
"Sea of Tranquility" for Earthlings With				
Ulcers	Scan	10/2	117	(1.0)
Oxygen Sniffer	Barnes	7/10	47	(2.0)
Grafting Men Together Again	Barnes	8/21	20	(7.0)
Epileptics May Get Attack-Warning De-				
vice	N/T	6/26	12	(0.6)
Spacecraft Sterilizers Set Bacteria-Toast-				
ing Standards	N/T	2/20	18	(0.5)
The Solid-State Cowbell	N/T	7/10	14	(1.3)
Lifting Rubber Fingers Curl, Squeeze,				
and Hold	N/T	10/16	10	(0.8)
New Treatment for Cancer: Ultrasonics,				
Chilling, and Poison	N/T	10/30	40	(0.5)
Simple Pump Moves Human Blood	N/T	12/25	14	(0.6)
Progress in Biomedical Engineering	CD	1/23	172	(3.0)
What Good Is Holography	Aronson	1/23	26	(17.0)
Optical Computers	Khol	8/21	117	(9.0)
Holography: What the Germans Are				
Doing	Heumann	9/18	20	(3.0)
Optoelectronics	Khol	10/16	156	(12.0)
Optoelectronics, Part 2	Khol	11/13	208	(10.0)

Gyro 'Platform' Added To Hand-Held	N/T	1/9	10	(0.6)
Binoculars	N/T	6/26	10	(0.5)
Holograms Shrink Computer Memories	N/T	1/9	14	(0.5)
Foul-Weather Viewer Sees Through Fogs				
New Treatment for Cancer: Ultrasonics,	N/T	10/30	40	(0.5)
Chilling, and Poison				
Ultrasonic Testing of High-Strength				
Alloys	CD	3/6	164	(2.5)
X-15: Black Bullet That Paved a Path				
To the Moon	N/T	11/27	30	(5.0)

78. Environmental Design

Weather: The Questionable Art of Al-				
teration	Wood	3/20	33	(8.0)
Keeping Patients Pure	Barnes	4/3	42	(3.0)
Design to Control Corrosion	CD	8/7	136	(2.3)
The Little Yellow Monster-Chasing Sub-				
marine	Spector	7/10	42	(1.0)
Trip Guide To Apollo 10	Wise	5/15	36	(4.0)
Twin Mariners Nearing Mars	Wise	6/24	20	(3.0)
Elation, Apprehension Stir Scientific Com-				
munity On Eve of Apollo 11	Wise	7/10	36	(4.0)
The Next Big Step: Stations in Space	Wood	12/25	20	(6.0)
Research Council Calls for More Spend-				
ing on Satellites	N/T	3/6	18	(0.5)
Factories in Orbit Won't Lack Work	N/T	4/17	44	(0.5)
All-Purpose Space Station Planned for				
M-70s	N/T	5/15	15	(0.5)
Best Window Opening for Outer-Planet				
Flybys	N/T	6/24	10	(0.5)
Modular Space Station Could Grow Into				
50-Man Base	N/T	11/13	12	(0.5)
Astronauts Will Search for Surveyor	N/T	11/13	49	(1.0)
Human Factors Checked Out In DSSV				
Test	N/T	1/23	10	(0.8)
Boom in Bottom Bases	Barnes	2/6	18	(8.0)
Assault On the Sea	Wise	4/17	20	(8.0)
Emergency Air System Ready for Res-				
cue Sub	N/T	5/15	10	(0.5)
Ocean-Bottom Drillers Told to Stay At It	N/T	11/27	28	(0.6)
Off-The-Shelf Underwater Habitat	N/T	11/27	42	(1.0)
Weather	Wood	3/6	19	(14.0)

Engineering Management, Personal

81. Engineering Department Operations

Plan Promotes Productivity	Kahle	10/2	102	(4.0)
Need-To-Know for the Manager-In-Train-				
ing	Karger &	6/24	98	(4.0)
Lending Engineers	Lavole	5/29	92	(5.0)
If You Manage Engineers	Rossnagel	8/21	107	(5.0)
How To Move Up Without Dropping Out				
Abilities Are Applied	Taylor	10/2	98	(4.0)
What Causes Discontent?	(Article)	11/27	108	(3.0)
The Failure of Functionalism	Brown	12/11	144	(2.0)
Spark for Keeping a Project On Schedule	Brown	5/15	138	(6.0)
Bridging the Communications Gap				
From Your Side	D'Aprix	11/13	180	(3.0)
Paper Work for Job Hunting	Carr	8/7	102	(2.0)
Help Engineers Grow	Karger &	9/4	104	(4.0)
	Murdick	5/29	7	(5.0)
	Strauss			
What's Your JSQ?				
Technical Employment Opportunities Show				
Large Gain	N/T	3/6	8	(0.7)
Demand Reached New High for Class				
of '60	N/T	8/7	8	(0.7)
Draft Opens Schools To Foreign Engineers	N/T	5/15	8	(0.8)
Sharpest Rise in Engineers' Pay Posted				
In 1968	N/T	7/10	8	(1.0)
Pay Hike OKed for Federal Engineers	N/T	10/2	8	(0.6)

82-84. New Products, Drafting, Testing

Riot Control	Aronson	1/9	22	(9.0)
Product Planning by Computer	Correns	1/23	161	(2.0)
Ingredients for Successful Proposals	DeGeorge	4/3	122	(5.0)
Before It's Too Late, Denovate	Spector	4/3	20	(7.0)
Guidance System for Innovation	Spector	9/18	26	(5.0)
R&D: Term for Accountants Only	N/T	6/24	8	(0.7)
Project Task Teams	Stratton	6/26	102	(5.0)
Eliminating Vanishing-Point Spread	Duncan	8/21	139	(1.0)
Electric Photographs Developed Without				
Silver	N/T	1/9	12	(0.5)
Supercamera Creates Precise Circuit				
Boards	N/T	10/16	12	(0.5)
New Techniques in Joining	CD	8/21	144	(1.5)
From Computer To Microfilm—Nonstop	N/T	1/23	18	(3.0)
Just the Fax	Klein	2/20	20	(6.0)
A New Engineering Facility	Goldberg	3/6	125	(2.0)
Nondestructive Testing	Lavole	9/4	121	(15.0)
Prognosis With Plastic Models	Wright &			
	Bannister	8/21	135	(5.0)
Tire Makers Devise Nondestructive Test	N/T	8/21	10	(0.5)

Resistance Wire Cycles Test Load Ap-				
plication	Scan	1/9	133	(0.7)
Test Chamber Simulates the Rigors of				
Re-entry	N/T	3/20	14	(1.3)
Nine-Lane Track Tests New Tires	DI	11/27	48	(1.0)
Accelerating Lubricants Tests	CD	10/16	188	(2.2)

85. Technical Information

Government Information Sources	Clarke	10/30	96	(8.0)
Ultrasonic Testing of High-Strength				
Alloys	CD	3/6	164	(2.5)
Engineering Standards for Small Com-				
panies	Landau	10/16	140	(6.0)
Read It Like It Is	Ebel	3/20	175	(3.0)
Building 'Show' Biz Into Technical Talks	D'Aprix	4/3	127	(4.0)
Speech-Making for the Unaccustomed				
Engineer	Prahalls	12/11	146	(3.0)

87, 88. Personal, Professional, Outside Services

How the New Grads Measure Up	Chipman	9/18	227	(3.4)
Help Engineers Grow	Karger &			
	Murdick	9/4	104	(4.0)
Noble Motives and Rich Rewards	Khol	9/18	178	(12.0)
Technology's Privileged Offspring	Klein	9/18	198	(6.0)
The New Social Involvement	Marlowe	9/18	218	(2.5)
The Engineer As a Professional	Robbins	9/18	221	(3.8)
The Engineer's Image	Ruder	9/18	225	(2.6)
Living With Runaway Technology	Spector	9/18	190	(8.0)
Revolution in Engineering Education	Trihus	9/18	215	(3.6)
They'd Rather Stay Than Switch	(Article)	12/25	50	(4.0)
Shape Up and Act Professional, Design-				
ers Are Told	N/T	8/7	42	(0.6)
Forcing Ideas With Synectics	Raudsepp	10/16	134	(6.0)
Ten Draftsmen Honored With Grand De-				
sign Awards	N/T	1/9	21	(1.0)
Are Creative Engineers 'More Equal'				
Than Others?	N/T	7/10	106	(4.0)
Making Meetings Count	Zawacki	1/23	130	(3.0)
Games Engineers Play	Raudsepp	2/20	130	(6.0)
Promote Your Idea	Herzog	3/6	122	(3.0)
Radio-Control Models	Spector	11/13	20	(8.0)
International Mechanisms Group Estab-				
lished	N/T	10/30	42	(0.7)
New Engineering Society Slow Getting				
Started	N/T	11/13	66	(0.7)
Wescon Industrial Design Awards	N/T	8/21	36	(2.0)

Specific Machines and Equipment

911. Ordnance

An Album of Design	(Article)	9/18	214	(11.0)
Riot Control	Aronson	1/9	22	(9.0)
Where Roads Don't Count	Aronson	5/1	36	(7.0)
European Fighter Aircraft	Aronson	10/16	44	(6.0)
New Ideas for Artillery	Aronson	12/11	26	(2.0)
Design for Battlefield Survival	Orgorkiewicz	11/13	36	(8.0)
New Armor Materials	Orgorkiewicz	11/27	36	(4.0)

912. Machinery

Mechanizing the Malls	Klein	3/20	20	(7.0)
Universal Power Units	Zimmerman	11/13	52	(3.0)
Safe Power Lawn Mower Throws Debris Forward	N/T	10/2	42	(1.0)
Truck's Load Slides on "Window Shades"	N/T	11/27	14	(1.3)
Air Knives Strip Sterilizer From Milk Wrapper	Scan	10/2	118	(0.5)

913. Electrical Machinery

Underwater Watchdogs	Boyd	5/29	31	(4.0)
Multiplexing Takes Off	Klein	6/26	34	(5.0)
The ABCs of CATV	Klein	11/27	20	(5.0)
On the Beat With the Electronic Cop	Spector	4/3	39	(2.0)
The Self-Cleaning Oven Derby	Spector	4/17	47	(4.0)
Feeding People On the Go	Spector	10/2	20	(10.0)
Research Hope to Shock-Proof Radar	N/T	3/6	14	(0.5)
Prototype Ready for Hang-On-Wall TV	N/T	6/24	10	(0.5)
Telephone Pictures Show What Computer Remembers	N/T	6/24	14	(0.5)
Laser Finds Job in Home-Entertainment System	N/T	10/30	12	(0.7)
Coming: The Trash Masher	N/T	11/27	45	(0.7)
Design Program Previews Home Appliances of the Future	N/T	12/11	32	(2.0)
Switch to D-C Leaves Turntable Wowless	Scan	10/2	119	(0.5)

914. Transportation

Foreign Car Sampler	Aronson	2/20	47	(4.0)
River-Boat Design	Aronson	7/10	20	(9.0)

The Zeppelins Are Coming (Again?)	Heumann	10/2	45	(3.0)
The Urban Mobility Hang-Up	Wise	4/17	36	(6.0)
Stripes, Scoops, and Spoilers—Signs of the Swinging '70s	Wise	9/4	20	(14.0)
Andy at Indy	Wood & Wise	5/15	20	(10.0)
Piggyback Models Mimic Spacecraft	Wood	1/9	40	(4.0)
The Automated Sky	Wood	10/30	19	(9.0)
Universal Power Units	Zimmerman	11/13	52	(3.0)
Escape Machines for All Seasons: ATVs People-Carrying Cylinders Pop Out of Pneumatic Tubes	N/T	1/9	14	(0.8)
Tampa Solves Terminal Sprawl	N/T	1/9	48	(3.0)
From Junk Cars, India's Tractors?	N/T	2/6	10	(0.7)
Go-Ahead Given on Big Surface-Effect Ship	N/T	2/20	10	(0.5)
Granate,il Goes Conventional, Almost	N/T	3/6	10	(1.7)
Frontier Runways Pose No Problems	N/T	4/3	18	(0.7)
Ford's Maverick: Bred and Built by Computer	N/T	4/3	31	(1.0)
World War II Airplanes Make a Mini-Comeback	N/T	6/24	44	(0.6)
Not a Warmed-Over F-111	N/T	7/10	44	(1.0)
Return of the Hornet	N/T	8/21	18	(1.0)
Build It, Then Fly It Away	N/T	9/4	12	(1.0)
Air Bag Passes Taxing Tests	N/T	9/18	10	(0.5)
Balloon Floats Downed Pilot Out of Enemy's Reach	N/T	9/18	25	(0.5)
Parenttheses Propel Platform	N/T	10/30	34	(1.0)
Braking Study Seeks Best Runway	N/T	10/30	44	(0.7)
Steamer Assaults Speed Record	N/T	11/13	14	(1.3)
Three Aircraft Endurance Records Fall	N/T	12/25	10	(0.5)
Special Hoist Serves "Harrier" VTOL	DI	5/29	48	(0.5)
New Flat Has Front-Wheel Drive	DI	5/29	48	(0.5)
Frankfurt Auto Show Previewed	DI	8/21	41	(0.5)
VW '70	DI	9/18	38	(2.0)
Holden Hurricane	DI	10/2	34	(1.0)
Italian Luxury Car	DI	10/2	39	(0.5)
Opel Idea Car	DI	10/30	47	(0.5)
Four People-Movers: 30 by Capsule	DI	10/30	50	(0.7)
The Walking Truck	(Article)	4/17	32	(3.0)

915. Instruments

Photo Enlargements in a Minute	Spector	9/18	14	(1.3)
Scanning Electron Microscope	(Article)	6/24	106	(7.0)
Thermistored Nosepiece Makes Breathing Easier	Scan	11/13	188	(0.5)

Using the classification system provides nine major (one-digit) classifications, each of which has up to nine (two-digit) sub-classifications. These, in turn, are divided into ten (three-digit) indexing classifications.

Indexing classifications ending in 0 (General) are used to index material concerning several or all indexing classifications ending in 1 through 8. Classifications ending in 9 (Other) are used for material falling within the sub-classification but not within any of the items 1 through 8.

MACHINE DESIGN Subject Classification System

1-ELECTRICAL & ELECTRONIC

11 Motors

- 110 General
- 111 Fractional (less than 1 hp)
- 112 Ac integral horsepower
- 113 Dc integral horsepower
- 114 Universal (dc and ac)
- 115 Multispeed
- 116 Gearmotors
- 117 Torque
- 118 Definite and special purpose
- 119 Other

12 Power Supplies

- 120 General
- 121 Batteries (dry and wet)
- 122 Dc generators, motor-generators
- 123 Ac generators (alternators), motor-generators
- 124 Converters, inverters
- 125 Transformers
- 126 Fuel cells, solar cells, photo cells
- 127 Thermoelectric supplies
- 128
- 129 Other

13 Switches & Relays

- 130 General
- 131 Mechanical (pushbutton, lever, rotary, mercury)
- 132 Thermally operated (thermostats)
- 133 Pressure operated
- 134 Limit
- 135 Proximity, photoelectric
- 136 Stepping
- 137 Relays, circuit breakers
- 138 Motor starters (motor controls)
- 139 Other (reed)

14 Instruments & Controls

- 140 General
- 141 Sensing devices (transducers, thermocouples)
- 142 Solenoids, electric actuators
- 143 Timers, timing motors, delays
- 144 Synchros
- 145 Instrument motors
- 146 Data recorders, readouts, indicators
- 147 Meters, gages
- 148 Servo motors, stepping motors
- 149 Other

2-FLUID POWER

21 Fluids

- 210 General
- 211 Hydraulic fluids
- 212 Coolants
- 213
- 214
- 215
- 216
- 217
- 218
- 219 Other

22 Fluid Conditioners

- 220 General
- 221 Fluid storage (pressure vessels)
- 222 Filters, strainers
- 223 Renovators
- 224 Heat exchangers
- 225 Coolers
- 226 Heaters
- 227 Driers
- 228
- 229 Others

23 Fluid Conductors

- 230 General
- 231 Tubing (pressure)
- 232 Hose
- 233 Pipe
- 234 Fittings
- 235 Joints, couplings
- 236
- 237
- 238
- 239 Other

24 Linear Devices

- 240 General
- 241 Cylinders
- 242 Accumulators
- 243 Intensifiers
- 244 Actuators (bellows, diaphragms)
- 245 Pumps (linear)
- 246
- 247
- 248
- 249 Other

25 Rotary Devices

- 250 General
- 251 Pumps (rotary)
- 252 Fluid Motors
- 253 Air motors
- 254 Compressors

15 Circuit Components

- 150 General
- 151 Resistors (rheostats, potentiometers)
- 152 Capacitors
- 153 Inductors
- 154 Solid-State devices (diodes, transistors, SCR's, rectifiers, semiconductors, integrated circuits)
- 155 Tubes
- 156 Saturable reactors (magnetic amplifiers)
- 157 Fuses
- 158 Lasers, masers
- 159 Other

16 Connectors & Wiring

- 160 General
- 161 Rings, brushes, commutators
- 162 Terminals, binding posts
- 163 Contacts (buttons)
- 164 Plugs, receptacles, connectors
- 165 Wiring (cable, cord, coil, harness)
- 166 Printed circuits, stitched circuits
- 167
- 168
- 169 Other

17 Miscellaneous Components

- 170 General
- 171 Electromagnets, magnets
- 172 Chassis, control panels
- 173 Insulation, encapsulation, shielding
- 174 Cooling elements
- 175 Lamps, lighting elements (fiber optical)
- 176 Heaters, heating elements
- 177 Electric clutches & brakes
- 178
- 179 Other

19 Systems & Assemblies

- 190 General
- 191 Amplifiers, preamps
- 192 Control systems (regulators, numerical control)
- 193 Electronic computers
- 194 Other electronic
- 195 Adjustable-speed drives
- 196 Servomechanisms
- 197 Other electromechanical
- 198 Packaging
- 199 Other

255 Rotary actuators

- 256
- 257
- 258
- 259 Other

26 Seals

- 260 General
- 261 Materials seals (O-rings)
- 262 Mechanical seals
- 263 Gaskets
- 264 Wiper rings
- 265 Packings
- 266
- 267
- 268
- 269 Other

27 Valves

- 270 General
- 271 Direction control
- 272 Flow control
- 273 Pressure control (relief)
- 274 Servo valves
- 275 Valve blocks (manifolds)
- 276 Nozzles
- 277
- 278
- 279 Other

28 Instruments & Controls

- 280 General
- 281 Test stands
- 282 Control panels
- 283 Meters, gages
- 284 Switches
- 285 Transducers (to hydraulic)
- 286 Regulators
- 287 Fluidic devices
- 288
- 289 Other

29 Systems & Assemblies

- 290 General
- 291 Industrial hydraulic & pneumatic systems
- 292 Mobile, aircraft, marine
- 293 Hydrodynamic drives
- 294 Hydrostatic drives
- 295 Vacuum
- 296 Lubrication
- 297 Hydraulic, pneumatic computers
- 298
- 299 Other

3-MECHANICAL

31 Power Sources

- 310 General
- 311 Jet engines
- 312 Internal-combustion engines
- 313 Turbines
- 314 Atomic, nuclear power
- 315 Exotic fuel engines (rockets)
- 316 Fuels, propellants
- 317
- 318
- 319 Other

32 Constant-Speed Drives & Transmissions

- 320 General (speed reducers)
- 321 Chain
- 322 Belt
- 323 Friction (ball, disc, wheel, cone)
- 324 Gear
- 325
- 326
- 327
- 328
- 329 Other

33 Adjustable-Speed Drives & Transmissions

- 330 General (speed reducers)
- 331 Chain
- 332 Belt
- 333 Friction (ball, disc, wheel, cone)
- 334 Gear
- 335
- 336
- 338
- 339 Other

34 Drive Components

- 340 General
- 341 Transmission chain, cable
- 342 Belts, belting
- 343 Gears, gearing
- 344 Sprockets
- 345 Pulleys, sheaves
- 346 Conveyor chain, conveyor cable
- 347 Conveyor screws
- 348

349 Other

35 Rotational Components

- 350 General
- 351 Antifriction bearings (ball, roller, needle)
- 352 Sleeve bearings (gas, solid-lubricant), bushings
- 353 Flexible couplings, universal joints, flexible shafts
- 354 Torque converters, fluid couplings
- 355 Shafts, axles, splines, pinions, crankshafts
- 356 Clutches, brakes
- 357 Fans, blowers
- 358
- 359 Other

36 Mechanisms

- 360 General
- 361 Cam
- 362 Linkages
- 363 Intermittent-motion (periodic-motion, indexing)
- 364 Three dimensional
- 365 Motion converters (leadscrews)
- 366 Spring motors
- 367
- 368
- 369 Other

37 Controls

- 370 General
- 371 Push-pull
- 372 Transducers (to mechanical)
- 373 Gyros, gyroscopes
- 374 Counters
- 375
- 376
- 377
- 378
- 379 Other

39 Systems

- 390 General

4-ASSEMBLY COMPONENTS

41 Fasteners

- 410 General
- 411 Inserts
- 412 Nuts
- 413 Pins
- 414 Quick operating (panel-type, latches)
- 415 Retaining rings, keys, collars
- 416 Rivets
- 417 Screws, bolts, studs
- 418 Washers, grommets, eyelets
- 419 Other (spring clips, clamps)

42 Springs & Isolation Devices

- 420 General
- 421 Fluid & air springs
- 422 Helical-wire springs
- 423 Leaf springs
- 424 Vibration isolators, mounts
- 425 Hydraulic-damping devices (shock absorbers, snubbers)

426 Mechanical-damping devices

- 427
- 428
- 429 Other
- 430 General
- 431 Locks
- 432 Nameplates, labels
- 433 Dials, knobs, handles
- 434 Shims
- 435 Enclosures
- 436 Wheels, tires, rollers, casters
- 437 Slides
- 438 Hinges, brackets
- 439 Other

49 General

- 490 General

5-MATERIALS

51 Ferrous Metals

- 510 General
- 511 Cast iron, malleable iron, cast carbon, alloy steels
- 512 Wrought carbon, alloy steels
- 513 Free-machining steels
- 514 Stainless steels, high alloys, high-temperature steels
- 515 Specialty steels (tool, die, electrical)
- 516
- 517
- 518
- 519 Other

52 Nonferrous Metals

- 520 General
- 521 Aluminum
- 522 Copper, Brass, Bronze
- 523 Magnesium
- 524 Nickel
- 525 Titanium
- 526 Zinc
- 527 Refractory metals (tungsten, tantalum, molybdenum, columbium)
- 528 Precious metals
- 529 Other

53 Plastics

- 530 General
- 531 Thermoplastic plastics (nylon, Teflon)
- 532 Thermosetting plastics (epoxy, phenolic, filled silicones, rigid urethanes)

533 Laminated plastics, vulcanized fiber

- 534 Reinforced, filled plastics
- 535
- 536
- 537
- 538
- 539 Other

54 Rubber & Elastomer

- 540 General
- 541 Natural rubber
- 542 Synthetic rubber
- 543 Elastomeric plastics (flexible silicones & urethanes)
- 544 Hard rubber
- 545
- 546
- 547
- 548
- 549 Other

55 Joining Materials

- 550 General
- 551 Adhesives, sealants
- 552 Welding rods
- 553 Brazing, soldering alloys
- 554
- 555
- 556
- 557
- 558
- 559 Other

5-MATERIALS (continued)

- 56 Other Nonmetals**
- 560 General
- 561 Carbon, graphite
- 562 Glass, ceramics
- 563 Refractory materials, mica
- 564 Carbides, cermets
- 565 Mineral & synthetic fibers, felt
- 566 Insulating materials (thermal)
- 567 Wood, cork, composition board, paper
- 568 Chemicals
- 569 Other
- 57 Finishes, Coatings & Lubricants**
- 570 General
- 571 Metallic coatings
- 572 Chemical coatings, electrochemical coatings
- 573 Organic finishes (lacquers, synthetic enamels, paints, varnishes)
- 574 Porcelain enamels, vitreous coatings
- 575 Plastic coatings
- 576 Lubricating materials
- 577
- 578
- 579 Other
- 58 Prefabricated Forms**
- 580 General
- 581 Film, tape, sheet, foil
- 582 Wire, wire cloth, wire rope, cable
- 583 Patterned, perforated, expanded metals
- 584 Laminates (other than laminated plastics)
- 585 Composite materials
- 586 Structures (honeycomb, foam, sandwich)
- 587 Structural shapes (tubing, channels)
- 588 Balls
- 589 Other
- 59 General**
- 590 General

6-MANUFACTURING PROCESSES

- 61 Metal Casting**
- 610 General
- 611 Sand
- 612 Shell mold
- 613 Permanent mold
- 614 Centrifugal
- 615 Investment
- 616 Die
- 617
- 618
- 619 Other
- 62 Metal Shaping**
- 620 General
- 621 Forging
- 622 Extrusion, impact extrusion
- 623 Heading, upsetting
- 624 Thread, form rolling
- 625 Powder metallurgy
- 626
- 627
- 628
- 629 Other
- 63 Metal Forming**
- 630 General
- 631 Sheet, plate forming
- 632 Stamping, drawing
- 633 High-velocity forming (explosive forming)
- 634 Spinning
- 635 Roll forming
- 636 Tube forming
- 637 Wire forming
- 638
- 639 Other
- 64 Metal Joining**
- 640 General
- 641 Arc welding
- 642 Gas welding
- 643 Resistance welding
- 644 High-energy welding (plasma, electron beam, explosive bonding)
- 645 Flame cutting
- 646 Brazing
- 647 Soldering
- 648 Adhesive joining, bonding
- 649 Other
- 65 Metal Removal**
- 650 General
- 651 Planing, broaching
- 652 Lathe, screw machining
- 653 Milling, hobbing, gear shaping
- 654 Drilling, boring
- 655 Grinding, abrasive machining
- 656 Honing, lapping, polishing
- 657 High-energy machining (spark, laser)
- 658
- 659 Other
- 66 Metal Treating**
- 660 General
- 661 Heat treating
- 662 Surface treating (carburizing, nitriding)
- 663 Shot peening, surface working
- 664 Chemical milling, etching
- 665
- 666
- 667
- 668
- 669 Other
- 67 Finishing**
- 670 General
- 671 Chemical, solvent cleaning
- 672 Mechanical finishing
- 673 Conversion coating (anodizing) electro-polishing
- 674 Electroplating, vacuum metallizing
- 675 Metal spraying (flame spraying), hard facing
- 676 Painting
- 677
- 678
- 679 Other
- 68 Plastics & Rubber Processes**
- 680 General
- 681 Molding
- 682 Extrusion
- 683 Sheet forming
- 684 Laminating
- 685 Casting
- 686 Stamping, machining, fabricating, forming
- 687 Calendaring, coating
- 688 Encapsulation
- 689 Other (filament winding)
- 69 General**
- 690 General

7-DESIGN THEORY & TECHNIQUES

- 71 Mechanics**
- 710 General
- 711 Statics (at rest)
- 712 Dynamics (force to create motion)
- 713 Kinematics (motion in abstract)
- 714 Vibration
- 715 Shock
- 716 Noise, sound, music
- 717
- 718
- 719 Other
- 72 Strength of Materials**
- 720 General
- 721 Elastic theory
- 722 Plastic theory
- 723 Fatigue, endurance
- 724 Creep
- 725 Impact stress
- 726 Thermal stress
- 727 Friction
- 728
- 729 Other
- 73 Strength of Parts**
- 730 General
- 731 Tension, compression
- 732 Bending
- 733 Shear, torsion
- 734 Surface contact stress
- 735 Plates
- 736 Cylinders, columns
- 737 Rotating discs
- 738
- 739 Other
- 74 Human-Factors Engineering**
- 740 General
- 741 Styling
- 742 Color
- 743 Safety
- 744 Illumination
- 745 Human limitations
- 746
- 747
- 748
- 749 Other

7-DESIGN THEORY & TECHNIQUES (continued)

- 75 Design Analysis & Synthesis**
- 750 General
- 751 Mathematical methods (statistics)
- 752 Graphical techniques
- 753 Analogs, models
- 754 Computer techniques
- 755 Reliability, quality control
- 756 Dimensioning (tolerances)
- 757
- 758
- 759 Other
- 76 Basic Sciences & Fields**
- 760 General
- 761 Physics
- 762 Chemistry
- 763 Thermal (cryogenics, heat transfer)
- 764 Radiation
- 765 Biosciences
- 766 Optics (photography)
- 767 Ultrasonics
- 768
- 769 Other
- 77 Experimental Design**
- 770 General
- 771 Prototypes, breadboards
- 772 Testing (stress analysis)
- 773
- 774
- 775
- 776
- 777
- 778
- 779 Other
- 78 Environmental Design**
- 780 General
- 781 Corrosion, rust
- 782 Mold, fungus
- 783 Outer space
- 784 Under sea
- 785
- 786
- 787
- 788
- 789 Other
- 79 General**
- 790 General

8-ENGINEERING MANAGEMENT & OPERATION

- 81 Engineering Department Operations**
- 810 General
- 811 Structure, organization
- 812 Costs
- 813 Programming, planning
- 814 Personnel policies
- 815 Recruiting, evaluation, training
- 816 Managerial talent
- 817 Compensation
- 818
- 819 Other
- 82 New Product Development**
- 820 General
- 83 Drafting & Reproduction**
- 830 General
- 831 Management, control systems
- 832 Drafting practices, techniques
- 833 Technical illustration
- 834 Drafting equipment
- 835 Reproduction equipment, systems
- 836 Furniture
- 837
- 838
- 839 Other
- 84 Laboratory & Testing**
- 840 General
- 85 Technical Information**
- 850 General
- 851 Engineering libraries, files
- 852 Information classification, retrieval
- 853 Specifications, standards
- 854 Report writing, articles, papers, oral
- 855 Part numbering
- 856 Engineering records
- 857
- 858
- 859 Other
- 86 Patents & Patent Law**
- 860 General
- 87 Personal & Professional**
- 870 General
- 871 Creativity, inventiveness
- 872 Meetings, shows
- 873 Other personal
- 874 Societies
- 875 Professional licensing
- 876 Unions
- 877
- 878
- 879 Other professional
- 88 Outside Services**
- 880 General
- 881 Engineering design services
- 882 Industrial design services
- 883
- 884
- 885
- 886
- 887
- 888
- 889 Other
- 89 General**
- 890 General

9-MISCELLANEOUS

- 91 Complete Machines**
- 910 General
- 911 Ordnance (tanks, missiles, rockets, ammunition, SIC 19)
- 912 Machinery (agricultural, construction, machine tools, office machinery, materials handling, SIC 35)
- 913 Electrical machinery (communications, radio radar, TV, appliances, X-ray, SIC 36)
- 914 Transportation (automotive, aircraft, ships, railroad, SIC 37)
- 915 Instruments (medical, dental, photographic, watches, SIC 38)
- 916 Fabricated metal products (hand tools, etc., SIC 34)
- 917
- 918
- 919 Other
- 99 Unclassified**
- 990 General
- (includes pages such as Editorials, "Back Talk," Covers, Contents Pages, etc.)

